CHROMOSOME NUMBERS IN *ERIGERON* AND *CONYZA* (COMPOSITAE)

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Though reports of chromosome numbers in the Compositae are extensive, the genus *Erigeron* has received relatively little attention. Of the approximately 147 currently recognized North American species north of Mexico, only about 66 have been studied cytologically, and infraspecific variation in chromosome number is known in about 26 of these. The counts reported here are from collections made mostly during the last three years and are peripheral to a more inclusive study of *Erigeron*.

Chromosome numbers are presented for 74 collections representing 1 species of *Conyza* and 23 of *Erigeron*; 9 are for previously unreported taxa and 1 differs from an earlier report for the same taxon. Counts were made either from buds fixed in the field with Farmer's solution (acetic alcohol 3:1; Sass, 1958) or from radicles grown from achenes in the laboratory, pretreated for 4 hours in 8-hydroxyquinoline, and fixed in Farmer's solution. Vouchers are deposited at NCU or at Jacksonville State University, Alabama; duplicates are at TEX and DUKE. Thanks go to Miklos Treiber for collecting buds and vouchers of several species and to David Whetstone, from whose Alabama collections achenes of *E. strigosus*, *E. annuus*, and *C. canadensis* were taken.

Table I. Species of *Erigeron* and *Conyza* examined for chromosome number.

Taxon	Chromosome number 2n	Locality and Collection
CONYZA:		
C. canadensis (L.) Cronq.	18 (1)†	ALABAMA: Cullman Co., just SE of Oak Level. *Whetstone 4845.*
	18 (8)	ALABAMA: Marshall Co., Guntersville. *Whetstone 6335.*
	9_{II}	LOUISIANA: LaSalle Parish, Olla. *Nesom R313.*
	9_{II}	NORTH CAROLINA: Jackson Co., Cashiers. *Nesom R309.*
ERIGERON:		
E. annuus (L.) Pers.	27 (1)	ALABAMA: DeKalb Co., 5 mi S of Ft. Payne. *Whetstone 3520.*

SIDA 7(4): 375—381.

	27 (3)	ALABAMA: Etowah Co., Walnut Grove. *Whetstone 4091.*
	27 (1)	ALABAMA: Franklin Co., 1 mi S of Russellville. *Whetstone 4474.*
	27 (5)	ALABAMA: Walker Co., 4 mi W of Jasper. *Whetstone 4728.*
	27_{I}	NORTH CAROLINA: Orange Co., Chapel Hill. *Nesom R319.*
	27_{I}	VIRGINIA: Pittsylvania Co., Gretna. *Treiber 1476.*
**E. basilobatus* Blake	27_{II}	MEXICO; NUEVO LEON: Cerro Potosí, 8 mi WNW of Galeana. *Nesom R566.*
	36_{II}	MEXICO; NUEVO LEON: Peña Nevada, ca. 35 mi E of Doctor Arroyo. *Nesom R574.*
E. bellidiastrum Nutt. var. *bellidiastrum*	9_{II}	UTAH: Garfield Co., 11 mi E of Escalante. *Nesom R38.*
	9_{II}	NEW MEXICO: Torrance Co., 19 mi SE of Willard. *Nesom R656.*
E. eatoni A. Gray subsp. *eatoni*	9_{II}	COLORADO: Mesa Co., 7 mi S of Mesa. *Nesom R11B.*
	9_{II}	COLORADO: Grand Co., 5 mi S of Grand Lake. *Nesom R355.*
	9_{II}	COLORADO: Gunnison Co., Sapinero. *Nesom R10.*
E. eximius Greene	18_{II}	NEW MEXICO: Taos Co., 1.5 mi E of Taos Ski Valley. *Nesom R681.*
	18_{II}	NEW MEXICO: Bernalillo Co., E side of Sandia Peak summit. *Nesom R669.*
	$12_{II} + 3_{IV}$	
	36 (4)	NEW MEXICO: Taos Co., 9 mi SE of Rodarte. *Nesom R684.*
**E. formosissimus* Greene var. *formosissimus*	9_{II}	NEW MEXICO: Sandoval Co., 22 mi W of Los Alamos. *Nesom R241.*
	9_{II}	NEW MEXICO: Rio Arriba Co., 2 mi W of Tres Piedras. *Nesom R672.*
**E. formosissimus* Greene var. *viscidus* (Rydb.) Cronq.	9_{II}	NEW MEXICO: Sandoval Co., 18 mi W of Los Alamos. *Nesom R240.*
	9_{II}	NEW MEXICO: Colfax Co., 11 mi SSW of Eagle Nest. *Nesom R213A.*
	18_{II}	NEW MEXICO: Bernalillo Co., 6 mi NW of Sandia Peak. *Nesom R665.*
	18 (5)	NEW MEXICO: Rio Arriba Co., 10 mi NW of Tres Piedras. *Nesom R676.*

*E. *leiomerus* A. Gray	18 (1)	NEW MEXICO: Valencia Co. *Spellenberg 4912.*
E. *lonchophyllus* Hook.	9_{II}	COLORADO: Chaffee Co., 7 mi E of Buena Vista. *Nesom R314.*
*E. *palmeri* A. Gray	18 (1)	MEXICO, NUEVO LEON: NE of Peña Nevada, 39 mi E of Doctor Arroyo. *Nesom R578.*
E. *peregrinus* (Pursh) Greene subsp. *callianthemus* (Greene) Cronq. var. *callianthemus*	18 (4)	NEW MEXICO: Taos Co., ca. 6 mi S of Red River. *Nesom R680.*
E. *philadelphicus* L.	9_{II}	LOUISIANA: Natchitoches Parish, Natchitoches. *Nesom R320.*
	9_{II}	NORTH CAROLINA: Burke Co., 6 mi S of Jonas Ridge. *Treiber 1411.*
	9_{II}	NORTH CAROLINA: Watauga Co., 4 mi E of Boone. *Treiber 1422.*
	9_{II}	PENNSYLVANIA: Cumberland Co., Carlisle. *Treiber 1478.*
E. *pinnatisectus* (A. Gray) A. Nels.	9_{II}	COLORADO: Clear Creek Co., Guanella Pass. *Nesom R258.*
E. *platyphyllus* Greene	9_{II}	NEW MEXICO: Lincoln Co., Sierra Blanca Ski Area. *Nesom R654.*
	18 (2)	NEW MEXICO: Otero Co., 9 mi NE of Cloudcroft. *Nesom R650.*
*E. *potosinus* Standley	18_{II}	MEXICO, NUEVO LEON: Cerro Potosí, 8 mi WNW of Galeana.
	$8_{IV} + 2_{II}$	*Nesom R567.*
	9_{II}	MEXICO, NUEVO LEON: Cerro Potosí, 8 mi WNW of Galeana. *Nesom R568.*
E. *pulchellus* Michaux	9_{II}	NORTH CAROLINA: Alleghany Co., Blue Ridge Parkway, 1 mi S of jct with Hwy 18. *Treiber 1445.*
	9_{II}	NORTH CAROLINA: Buncombe Co., Blue Ridge Parkway, 2 mi SEE of Asheville. *Treiber 1432.*
	9_{II}	NORTH CAROLINA: Jones Co., Island Creek, 6 mi S of New Bern. *Nesom R315.*
	9_{II}	NORTH CAROLINA: McDowell Co., Blue Ridge Parkway, 1.5 mi SW of jct with Hwy 80. *Treiber 1429.*
	9_{II}	NORTH CAROLINA: Montgomery Co., 1 mi WNW of Uwharrie. *Nesom R316.*

	9_{II}	NORTH CAROLINA: Orange Co., Chapel Hill. *Schram 122.*
	9_{II}	VERMONT: Windsor Co., 2 mi W of Woodstock. *Treiber 1466.*
E. pumilis Nutt. subsp. *concinnoides* Cronq.	18 (1)	COLORADO: Gunnison Co., 10 mi NE of Almont. *Spongberg s.n.*
E. rusbyi A. Gray	9_{II}	NEW MEXICO: Otero Co., 1 mi S of Cloudcroft. *Nesom R644.*
E. strigosus Muhl. ex Willd.	18 (8) 27 (2)	ALABAMA: Marshall Co., 7.3 mi E of Douglas. *Whetstone 3218.*
	27 (3)	ALABAMA: Morgan Co., 3 mi N of Hulaco. *Whetstone 2916.*
	36 (3) 27 (1)	ALABAMA: Morgan Co., Falkville. *Whetstone 2995.*
	18 (4)	ALABAMA: Tuscaloosa Co., Holt, 2 mi NE of Tuscaloosa. *Whetstone 4666.*
	18 (3)	ALABAMA: Winston Co., 6 mi ESE of Haleyville. *Whetstone 4279.*
	27 (4)	ALABAMA: Winston Co., Haleyville. *Whetstone 4499.*
	18 (6) 27 (2)	FLORIDA: Liberty Co., 5 mi E of Torreya State Park. *Nesom R325.*
	ca. 27_1	KENTUCKY: Hopkins Co., 2 mi N of Madisonville. *Nesom R305.*
	18 (1) 27 (1)	MISSISSIPPI: Harrison Co., Gulfport. *Nesom R324.*
	27 (2)	TEXAS: Kaufman Co., 24 mi E of Dallas. *Nesom R317.*
**E. subtrinervis* Rydb. subsp. *subtrinervis*	9_{II}	COLORADO: Alamosa Co., Great Sand Dunes Natl. Mon. *Nesom R248.*
	9_{II}	COLORADO: Park Co., 1 mi E of Weston Pass. *Nesom R288.*
	9_{II}	COLORADO: Park Co., 4 mi E of Grant. *Nesom R260.*
	9_{II}	COLORADO: Park Co., 8 mi SW of Lake George. *Nesom R272.*
	9_{II}	NEW MEXICO: Bernalillo Co., E side of Sandia Peak summit. *Nesom R667.*
	9_{II}	NEW MEXICO: Colfax Co., 0.5 mi ESE of Red River Pass. *Nesom R215.*
	9_{II}	NEW MEXICO: Rio Arriba Co., San Antonio Peak, 16 mi N of Tres Piedras. *Nesom R247.*
	9_{II}	NEW MEXICO: Taos Co., 11 mi E

		of Taos. *Nesom R207.*
	9_{II}	NEW MEXICO: Taos Co., 3 mi SW of Taos Ski Valley. *Nesom R223.*
**E. tenuis* T. & G.	9_{II}	LOUISIANA: Natchitoches Parish, 1 mi W of Natchitoches. *Nesom R318.*
	36 (1)	MISSISSIPPI: Hancock Co., Waveland. *Nesom R321.*
‡*E. utahensis* A. Gray	18 (1)	UTAH: Garfield Co., 2 mi E of Tropic. *Nesom s.n.* (no voucher).
**E. vetensis* Rydb.	9_{II}	COLORADO: Grand Co., 5 mi S of Grand Lake. *Nesom R354.*
E. vernus (L.) T. & G.	18 (4)	GEORGIA: Worth Co., 7 mi N of Sylvester. *Nesom R326.*
	18 (1)	MISSISSIPPI: Hancock Co., 3 mi W of Waveland. *Nesom R322.*
	9_{II}	MISSISSIPPI: Pearl River Co., Picayune. *Nesom R323.*

* First report for the taxon.

‡ First report of this chromosome number for the taxon.

† Numbers in parentheses after mitotic counts refer to the number of radicles for which the chromosome number was determined. All radicles for each collection were grown from achenes of a single head.

DISCUSSION

The first counts for *Erigeron formosissimus* (n=9, n=18) are given here. There are no apparent characters in the tetraploid plants from Bernalillo Co., N. M., which would distinguish them from known diploids of this taxon. However, immediately adjacent to the diploid clone of *E. formosissimus* var. *viscidus* from Colfax Co., N. M. (*Nesom R213A*), a clump of the same species (*Nesom R213B*) was collected which had produced pollen with extremely low stainability and much irregularity in size, indicating that it is probably polyploid. This putative polyploid clone has typical glandularity on the phyllaries and upper peduncle but differs from the adjacent, more typical, var. *viscidus* in having a noticeably more strigose involucre.

The tetraploid counts for *Erigeron eximius* (=*E. superbus* Greene, see Weber, 1973) in the Sangre de Cristo Range are interesting in that the previous tetraploid report for this species is from the Front Range in Boulder Co., Colo. (Love and Kapoor, 1967). A diploid count has been reported from Cochise Co., Ariz., by Watson (1973). The presence of tetravalents in the Bernalillo Co., N. M., plants suggests that they may be of autoploid origin.

Erigeron potosinus is known from Cerro Potosí in southern Nuevo Leon and from two additional localities in Tamaulipas, Mexico. It appears to be extremely closely related to *E. eximius*, and the two may eventually prove to be conspecific. Plants of both taxa produce herbaceous rhizomes, but

those of *E. potosinus* do so more prolifically and produce more dense clonal colonies. Both collections of *E. potosinus* reported here were made on the ENE side of Cerro Potosí in a subalpine meadow with scattered pines at about 3200-3300 meters in elevation, below the summit of about 3650 to 3820 meters (Beaman and Andresen, 1966). The second collection (*R568*) was made about 100 meters below the first (*R567*). From the first collection tetraploid counts were obtained from two plants; in both of them multivalent associations were observed and pairing ranged from 8_{IV}'s + 2_{II}'s to 18_{II}'s (though some loose pairing may have been present in the latter cell). Pollen from eight other plants from this locality was found to be over 96% abortive. Tetrads were formed most commonly, though some pentads were noted, but micrograins were commonly formed with the tetrads to incorporate individual laggard chromosomes not reaching either pole. The more normal sized pollen grains were malformed and mostly devoid of cytoplasm. Gross meiotic abnormalities do not appear to account for the high pollen sterility in these tetraploids. From the second collection of *E. potosinus* (R568) clear diploid counts were obtained from three plants with meiosis and tetrad formation normal in each. Of seven other plants from this locality from which pollen has been examined, two have over 90% viable pollen and are probably diploid. The other five have from 95% to 35% abortive pollen; micrograins commonly occur in three of these plants and all five are probably polyploid.

Lack of morphological distinction between the diploids and tetraploids of *Erigeron potosinus*, other than perhaps a slight size difference, and the presence of multivalents in the tetraploids are strong circumstantial evidence that autoploids are being formed on Cerro Potosí. The only other species of *Erigeron* seen in this area were *E. basilobatus* Blake and *E.* cf. *rudiflorus* Buckley; both were growing at a much lower elevation than *E. potosinus* and are morphologically distinct. The two collections of *E. potosinus* known from Tamaulipas are *Stanford, Taylor*, and *Lauber 2501A* (TEX and SMU) and *Stanford, Taylor*, and *Lauber 2673* (SMU). Gross irregularities in the pollen examined of two plants from each of these localities indicate that they are probably polyploid.

Both collections of *Erigeron basilobatus* ($n=27_{II}$, $n=36_{II}$) have noticeably aborted pollen, although pairing was apparently normal in all the cells observed. Pollen from an isotype of this species (*Muller 2934*, SMU) showed a lowered viability, indicating that these plants are probably also polyploid. Muller's collection was made in Nuevo Leon as were the two reported here.

The first chromosome counts for *Erigeron tenuis* ($n=9_{II}$, $n=18_{II}$) are presented here. Besides the tetraploid count near the southeastern extremity of the range of the species in Hancock Co., Miss., four other plants examined from Oktibbeha, Pearl River, and Rankin Cos., Miss., are also probably polyploid—an estimate based on their production of extremely abortive pollen. Of these four only the collection from Rankin Co. (*Jones 18591.2*) is atypical of the species in any apparent way; on the herbarium label

(NCU) it is noted by Dr. Jones as being unusual and has exceptionally large basal and lower cauline leaves.

The discovery of diploid *Erigeron strigosus* from Mississippi, Alabama, and Florida confirms the report by Turner and Flyr (1966) of diploid *E. strigosus* from Florida and establishes this southern area as a center of sexual populations for the species. Checks of pollen size and stainability from other locations in Alabama show that diploids also occur in Franklin, Blount, and Cullman Counties. Numerous other chromosome counts over the range of this widespread colonizer have been polyploid. The production of relatively high percentages of achenes with euploid chromosome numbers different from that of the megasporangiate parent is a phenomenon being documented in greater detail in *Erigern flagellaris* A. Gray, *Erigeron divergens* T. & G., and their relatives (Nesom, in progress). *Erigeron strigosus* apparently hybridizes freely with *E. annuus*, but plants of the latter species have not yet been found at a level other than triploid.

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